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AIRWORTHINESS REQUIREMENTS FOR AIRCRAFT COMPONENTS AND ACCESSORIES

EFFECTIVE MARCH 1, 1933

AIRWORTHINESS REQUIREMENTS FOR AIRCRAFT COMPONENTS AND ACCESSORIES

Chapter I GENERAL

Section 1. Scope of Requirements.

(A) These regulations shall apply to all important components and accessories which are manufactured as complete units and purchased by aircraft manufacturers and/or operators for use on licensed aircraft, except engines and propellers which are treated separately in Aeronautics Bulletin 7-G. They are supplemental to, and a part of the air commerce regulations specified in Aeronautics Bulletin 7, and are also supplemental to Aeronautics Bulletin 7-A which outlines the airworthiness requirements for aircraft.

(B) For the purpose of these regulations an accessory or component shall be considered important if, by malfunctioning, it can endanger the safety of the aircraft or the cargo or passengers in the aircraft, or persons or property beneath the aircraft.

(C) Because of the fact that the development of aircraft specialties is constantly increasing in scope and variety there undoubtedly will be important components and accessories developed from time to time which are not specifically provided for in these regulations. In such cases the general procedure for approval will be in accordance with these regulations and the manufacturer of the item in question shall apply to the Secretary of Commerce for special rulings particularly applicable to that product.

Sec. 2. Classification of Items.

(A) In view of the diversity of items to which these regulations arc applicable and the variety of their uses they are herein grouped in three major classifications dependent upon the approval procedure applicable to the particular item. The procedure to be followed is similar for all items and differs only in detail in accordance with the classification within which a specified item lies. All approved components and accessories may be used on licensed aircraft irrespective of the classification herein used but are subject, in all cases, to approval of the specific installation by the Secretary.

(B) It is desirable to approve a series of similar models of components or accessories under one approval in order to eliminate as much clerical and identification work as possible. This may be done for some types of wheels, position lights, and other items, a series of which are almost exactly similar in construction and differ only in size and. relatively unimportant structural details. This procedure may be applied to any item to which the manufacturer can show the procedure applicable.

(C) Items are classified as follows:

(1) Approved type certificates may be issued for each approved type or model or, where possible, series of similar models of the following items:

(a) Landing-gear wheels.

(b) Seaplane floats, excluding wing-tip floats.

(c) Skis, including pedestals.

(d) Position lights.

(e) Flares.

(2) Approved type certificates will not be issued for items such as the following, but they may be approved for use on licensed aircraft by means of an official letter of approval from the Department of Commerce which will be signed by a. properly authorized representative of the Secretary and stamped with the seal of the Aeronautics Branch of the Department of Commerce:

(a) Landing-gear shock-absorber units.

(b) Special flight-control units, including control wheels.

(c) Engine-control units.

(d) Autogiro rotor hubs.

(e) Special structural units.

(f) Safety belts.

(3) Units such as the following will be considered as parts of specific airplanes, and their suitability shall be demonstrated by data which shall form a part of the specific airplane file in accordance with the provisions of Aeronautics Bulletin 7-A:

(a) Wing ribs.

(b) Fuel and oil tanks.

(c) Auxiliary-engine cowling and other special cowling.

(d) Structure attaching seaplane floats to aircraft.

(e) Wing-tip floats.

(f) Structure attaching skis to aircraft.

(g) Cabin-heating and ventilating systems.

Sec. 3. Factors Affecting Approval.

All components and accessories falling within the meaning of these regulations, irrespective of their particular classification in section 2, and used on licensed aircraft shall:

(A) Satisfactorily fulfill the purpose for which they are intended.

(B) Be free from undue hazard, both in themselves and in their method of operation.

(C) Be constructed of suitable and dependable materials.

(D) Be manufactured and installed in accordance with the air commerce regulations in so far as those regulations pertain to the
particular unit.

Sec.4. Data Required for an Approved Type Certificate or a Letter of Approval.

Data submitted in connection with a request for the approval of an accessory or component shall include:

(A) An application for approval in duplicate, on forms which will be furnished for that purpose by the Secretary. The data requested on these forms include the actual weight of the complete unit under consideration.

(B) A complete set of drawings which contain all the dimensions and material specifications of the particular item. These drawings shall be in duplicate for the items listed in section 2(C)(1). Only one set of drawings shall be submitted for items listed in section (C)(2).

(C) A list, in duplicate, of the drawings submitted, giving the number and title of each drawing, preferably arranged numerically, or a complete parts list in duplicate if that system is standard practice with the manufacturer in question.

(D) The special data outlined in succeeding sections of those regulations for specific cases.

(E) In cases where such procedure is deemed advisable, or is specified in these regulations, one or more of the actual articles shall be submitted for examination and test.

(F) If the modifications to a previously approved component or accessory are not of sufficient extent to warrant a new model or type designation it is only necessary to submit revised drawings and drawing lists or parts lists for inclusion in the original approved file, and technical data. substantiating the changes.

Sec..5. Identification Data.

(A) Each type or model of a component or an accessory for which approval is requested shall be assigned a name or type number by the manufacturer so that it may distinguished from all other components or accessories of a nearly similar type.

(b) Each unit of an approved type of accessory or component shall be plainly and suitably marked to indicate that it has been approved. Such marking shall also show the model name or type number, together with either the serial number of the particular unit or the date of manufacture and such other information as the manufacturer may desire or as is specifically provided for in the following sections of these regulations. This information and that provided for in succeeding sections of these regulations shall be displayed in a conspicuous place on the unit and in such a manner that it may not be easily erased, disfigured, or obscured.

Sec. 6. Approval Conditions.

(A) Components or accessories which comply with the requirements herein outlined to the satisfaction of the Secretary may be approved for use on licensed aircraft, subject to the provisions and restrictions stated on the approved type certificate or letter of approval, as the case may be.

(B) Those components or accessories listed in section 2(C)(1), when approved, may be granted an approved type certificate at the option of the manufacturer, provided that the manufacturing facilities for producing the particular component or accessory in quantities are satisfactory to the Secretary and are such as to insure the exact similarity of all units of a particular type.

(C) When an approved type certificate is granted, one set of drawings is impressed with the seal of the Department of Commerce and is returned to the manufacturer. The other set is placed in the department's files. The department's inspectors may call for, and must have access to, these approved drawings when making an inspection at the manufacturer's plans to determine whether the units as built conform to the approved data.

(D) In all cases whether covered by a letter of approval or an approved type certificate the manufactured units shall be in exact accordance with the approved drawings and specifications.

(E) An approved type certificate will be issued upon the condition that on January 1 and July 1 of each year the manufacturer will file his affidavit with the Secretary of Commerce, showing the number of units of each type of accessory or component he has constructed under the approved type certificate during the six months immediately preceding the filing of the report, with a statement that no accessory or component is being constructed under such certificate deviating from the terms thereof.

(F) An approved type certificate or letter of approval may be suspended or revoked for:

(1) Violation of the air commerce act or any regulation promulgated thereunder on the part of the manufacturer.

(2) Failure of the manufacturer to make proper and seasonable reports.

(3) Any false statement on the part of the manufacturer in application for approval or information accompanying the application or in any report required under these regulations.

(4) Use or display of an approved type certificate or' other official notification from the Department of Commerce for fraudulent purpose or misrepresentation of any approved product.

(5) Use or display of an approved type certificate or other official notification from the Department of Commerce in any manner, contrary to the public safety or interest.

(6) Any demonstration of incompetency, carelessness, or negligence, or the use of inferior or improper material, on the part of the manufacturer.

(7) Failure of the manufacturer to maintain sufficient, and suitable equipment and personnel to insure the airworthiness and exact adherence to approved specifications of the products manufactured.

(8) Refusal of the manufacturer to submit to inspection upon proper demand by a representative of the Secretary, or to render any reasonable assistance in connection therewith.

(9) Moral irresponsibility of the manufacturer.

(10) Unsatisfactory operation of approved units in service, provided the cause of the unsatisfactory condition is within the control of the manufacturer.

Chapter II -- LANDING-GEAR WHEELS

Sec.7. Design Conditions.

(A) Aircraft landing-gear wheels will be approved for a maximum static load which will be determined from the strength of the wheel in accordance with figure 1. The minimum load for which a wheel will be approved is the

working load of the corresponding standard tire at the maximum recommended pressure. These values are given in table I for high-pressure tires and low pressure tires. Extra-ply and oversized tires may be used on approved wheels at the maximum working load of the tire provided the rated static load of the wheel is equal to, or greater than, the maximum working load of the tire. Standards for extra-low-pressure tires are given in table 2.

The values given in tables 1 and 2 are for front-wheel tires. Tail-wheel tires may be inflated to higher pressures and carry correspondingly higher loads within reasonable and safe limits.

Figure 1 is derived from figure 2 of Aeronautics Bulletin 7-A. The required radial test load per wheel is equal to the product of the rated load of the wheel, which is assumed to be half the gross weight of the airplane, the load factor required for the corresponding airplane and a material factor of 1.25. The values given by the side load curve are 35 percent of the radial load values.

(B) In cases where brakes are incorporated in wheels, the brake mechanism and its operation shall be satisfactory to the Secretary. Brakes shall be.free from any undue tendency to lock or jam.

TABLE 1. RATED LOADS FOR HIGH-PRESSURE (AND LOW-PRESSURE) TIRES

(a) HIGH-PRESSURE TIRES

Tire size	Recommended inflation pressure	Maximum static load	Tire size	Recommended inflation pressure	Maximum static load	Tire size	Recommended inflation pressure	Maximum static load
		Pounds			Pounds			Pounds
10 by 3	55	400	24 by 4	50	850	40 by 10	65	5,500
12 by 4	55	600	28 by 5	50	1,350	44 by 10	65	6,300
14 by 3	55	500	28 by 4	50	1,000	54 by 12	70	10,000
16 by 4	55	760	30 by 5	50	1,500	58 by 14	70	13,000
18 by 3	55	650	33 by 6	55	2,200			
20 by 4	55	825	36 by 8	60	4,000			

(b) LOW-PRESSURE TIRES

6.00-4	25	550	6.00-6	25	1,150	11.00-12	25	3,400
7.00-4	25	950	6.50-10	25	1,200	12.50-14	25	4,700
7.00-6	25	1,050	7.50-10	25	1,500	15.00-16	28	7,000
8.00-6	20	1,200	8.50-10	25	1,950			
9.00-6	20	1,600	9.50-12	25	2,500			

Note. -- The tires listed in table 1 are standard tires. Extra-ply tires, with correspondingly larger rated loads, are made in several of these sizes and may be used on approved wheels in accordance with sec. 7(A).

TABLE 2. RATED LOADS FOR EXTRA-LOW-PRESSURE TIRES

Tire size	Maximum static tire loads for reduction in axle BM		Highest loads	
	Load	Inflation pressure	Load	Inflation pressure
	Pounds		Pounds	
16 by 7-3	500	12½	500	12½
18 by 8-3	775	12½	775	12½
19 by 9-3	1,025	12½	1,025	12½
22 by 10-4	1,500	15	1,500	15
25 by 11-4	1,900	15	1,900	15
27 by 13-5	2,800	15	2,600	17½
29 by 13-5	2,700	15	3,350	20
35 by 15-6	3,700	15	4,600	20
40 by 18-7	5,550	15	7,000	20
44 by 20-8	6,900	15	8,700	20

Note: If no reduction in axle design bending moment is desired tires may be loaded to the amount shown in the last 2 columns. If no shock absorber strut is used in conjunction with tire the size of tire is limited by its shock-absorption capacity.

Sec.8. Technical Data Required.

The data submitted in substantiation of a request for approval of a wheel shall include the following, in addition to the data. specified in section 4:

(A) A report of static tests demonstrating compliance with the minimum wheel-strength requirements for each type or model wheel. Such tests shall demonstrate the strength of the wheel under radial loads and side loads. The radial and side loads shall be applied separately and the wheel shall be equipped with the correct size tire inflated to the proper pressure for the load for which approval is requested. The radial load shall be applied to the wheel in the plane of the tire and may be distributed over a portion of the tire by allowing the tire to bear in a box of firm earth or sand. The side load shall be applied to the tire at its maximum cross-sectional width and may be distributed over an arc of not more than 60°. When the side load is applied the wheel is to be restrained by the axle only. The report shall include complete details of the test, including a record of deflections and photographs of the test set-up, and shall be signed by the person making the test.

Sec. 9. Identification Data.

The identification data affixed to each wheel of an approved type shall contain the information specified in section 5(B) and shall also state the approved type certificate number under which the wheel has been manufactured and the maximum static load for which approval has been granted.

Chapter III -- SEAPLANE FLOATS

Sec. 10. Design Conditions.

(A) The main floats of seaplanes shall be designed to carry the following loads without failure or permanent buckling when supported at the strut fittings:

(1) A load upward, applied at the bow, and of magnitude equal to 75 per cent of the proportion of the airplane weight normally carried by the particular float.

(2) A load upward, applied at the stern, and of the magnitude specified in. paragraph (1).

(3) A load upward, applied at the step, and of magnitude equal to twice the proportion of the airplane weight normally carried by the particular float.

(B) Float bottoms shall be designed to withstand without permanent set a load of at least 8 pounds per square inch over that portion of the bottom lying between the first step and a section 25 per cent of the distance between the step and the bow. A load of at least 4 pounds per square inch shall be assumed from that section to a section at 75 per cent of the distance between the step and the bow. In designing the bow portion of the float due attention shall be paid to the effect of striking floating objects. For the section between the first and second steps a load of at least 4 pounds per square inch shall be used. If but one step is used, this load shall extend over that portion of the bottom between the step and a section 50 per cent of the length of the float aft of the step.

(C) The main floats of seaplanes shall have a buoyancy in excess of that required to support the gross weight of the airplane in fresh
water as follows: 80 per cent for.single floats and 90 per cent for double floats.

(D) Each main seaplane float shall contain at least five water-tight compartments of approximately equal volume on airplanes of more than 2,500 pounds gross weight and shall contain four such compartments on airplanes of less than 2,500 pounds gross weight.

(E) Floats will be approved as separate units without regard to the installation and will be approved in terms of static displacement. The approval of a type of float will be valid only for its use on aircraft within the weight limitations specified on the approved type certificate.

(F) The installation of floats shall be made in accordance with Aeronautics Bulletin 7-A. Only approved floats may be installed on licensed aircraft and the attachment structure will be considered part of the specific airplane as outlined in section 2 (C)(8).

Sec.11. Technical Data Required.

The data submitted in substantiation of a request for approval of a seaplane float shall include, in addition to the data specified in section 4:

(A) Computations of total and reserve buoyancy showing compliance with the requirements.

(B) A stress analysis of the float, including its fittings, for the conditions outlined in section 10.

Sec.12. Identification Data.

The identification data affixed to each float of an approved type shall contain the information specified in section 5(B) and shall also state the approved type certificate number under which the float has been manufactured and the maximum static load for which approval has been granted.

Chapter IV -- SKIS

Sec.13. Design Conditions.

(A) Skis are usually designed for use on the existing land-type landing gear, merely replacing the wheel. Therefore, it is desirable that ski pedestals shall be designed to fit axle stubs for standard wheels.

(B) Skis and ski pedestals shall be deigned in accordance with the following conditions:

(1) A load distributed uniformly along the ski bottom, symmetrically with respect to the axle in the fore and aft direction, the front
end of the ski carrying no load if it is at a greater distance from the axle than the rear end. The load shall. be equal to one-half the weight of the airplane multiplied by the landing load factor specified in Aeronautics Bulletin 7-A.

(2) A uniform side-load distribution as in (1) and applied on the edge of the ski bottom, the load to be of such magnitude that the resultant bending moment on the axle is the same as that obtained from the side load required for the interchangeable wheel.

(3) A concentrated side load applied at the ski bottom near the front end of the ski of such a magnitude as to produce a bending moment on the axle in a horizontal plane of the same magnitude as in (2).

(4) In order to simulate the loads encountered when landing in rough ice or passing over ground.which is not perfectly level, the ski structure shall be analyzed for a concentrated load equal to the total applied load specified in (1), and applied to the ski at a point directly under the axle.

Sec.14. Technical Data Required.

The data submitted in substantiation of a request for approval of a ski shall include the following, in addition to the data specified in section 4 :

(A) A stress analysis of the ski and pedestal, based on the requirements outlined in section 13.

(B) A report of static tests to destruction or to 150 per cent of the design load for skis which are so constructed as to be not susceptible. to accurate analysis.

Sec.15. Identification Data.

The identification data affixed to each ski of an approved type shall. contain the information specified in section 5 (B) and shall also state the approved type certificate number under which the ski has been manufactured and the maximum static load for which approval has been granted.

Chapter V -- POSITION LIGHTS

Sec.16. Design Conditions.

(A) *Angular limits.* - Position lights shall be so constructed and capable of being so mounted that each forward light will show an unbroken light between two vertical planes whose dihedral angle is 110°, measured to the left from dead ahead for the left light and correspondingly to the right from dead ahead for the right light, and that the rear light will show to the rear an unbroken light between two vertical planes whose dihedral angle is 140°, of which 70° lies on either side of dead aft. In all directions outside of these limits an additional tolerance of not more than 10° will be permitted within which the cut-off from maximum to minimum intensity shall be effected.

(B) Light intensity. - In all directions within 80° of the longitudinal axis forward and 70° of the longitudinal axis aft, subject to the limits specified in paragraph (A), the lights shall have an intensity of not less than 8 candlepower. In all other directions within the limits specified in paragraph (A) the lights shall have an intensity of not less than 4 candlepower. In all directions outside of the specified limits, except within the permissible tolerances, the lights shall have an intensity of not more than 1 candlepower. These limits and intensities are illustrated in figures 2 and 3.

(C) *Colors.* - Left-wing lights shall be aviation red, having a dominant wave length not less than 0.613 microns and 1.00 purity. Right-wing lights shall be aviation green having a dominant wave length not greater than 0.530 microns and purity not less than 0.42. The rear lights shall have a clear incandescent color.

(D) *Light covers.* - The light bulbs shall be protected by a cover which shall be of noncombustible material and so constructed that it will not change color, cloud, or suffer any considerable loss of transmission in use. The coloring of colored portions shall be completely diffused through the material.

Sec. 17. Technical Data Required.

As the forward, or right and left wing, lights are complementary they will be approved as a unit. The rear, or tail, light will be approved as a separate unit. The technical data to be submitted for approval of a complete set of position lights will include two applications for approval, one for the forward lights and one for the rear light and the data.specified in section 4. In addition, a complete set of lights shall be submitted to the Department of Commerce for test.

Sec.18. Identification Data.

The identification data affixed to each position light of approved type shall contain the information specified in section 5 (B) and shall also contain the approved type certificate number under which the light was manufactured.

Chapter VI - LANDING FLARES

Sec.19. Design Conditions.

(A) The application of a particular type parachute lauding flare on licensed aircraft shall be in accordance with the regulations current for each specific airplane which are dependent upon the specifications of the airplane and its type of operation as well as the specifications of the particular type flare. Those regulations are specified in Aeronautics Bulletin No. 7-E for aircraft engaged in scheduled operation and in Aeronautics Bulletin No. 7 for other types of operation.

(B) Flares are divided into three classifications, as follows:

(1) Flares having a light duration of at least three minutes, a light intensity of at least 200,000 candlepower, and a rate of descent not greater than 550 feet per minute.

(2) Flares having.a light duration of at least one and one-half minutes, a light intensity of at least 110,000 candlepower, and a rate of decent not greater than 550 feet per minute.

(3) Flares having a light duration of at least one minute, a light intensity of at least 70,000 candlepower, and a rate of descent not greater then 550 feet per minute.

Sec.20. Technical Data Required.

The technical data submitted in substantiation of a request for approval of a parachute landing flare shall include, in addition to the data specified in section 4:

(A) Two flares of each type or model for calibration tests at the Department of Commerce laboratory to determine the light intensity developed.

(B) Upon completion of the examination of technical data and the light intensity tests, five flares of each type or model, together with the complete installation, airplane and operating personnel shall be made available for functional tests. These tests may be made at any location desired by the manufacturer but will be made only in the event that the calibration tests show satisfactory results.

In the event that there is one failure out of the five flares submitted, five additional flares shall be submitted for test. Failure of 2 or more flares out of 10 dropped shall be sufficient grounds for disapproval. Approval will be granted only in the event. that all five original flares function satisfactorily or, in the event of one failure in the original five, the second five function satisfactorily.

Sec.21. Identification Data.

The identification data affixed to each flare of an approved type shall contain the information specified in section 5 (B), and shall also state the approved type certificate number under which the flare has been manufactured and the classification for which it is approved (class 1, 2, or 3 as listed in section 19 (B)).

Chapter VII -- COMPONENTS AND ACCESSORIES NOT ELIGIBLE FOR APPROVED TYPE CERTIFICATES

Sec.22. Components and Accessories Eligible for Letter of Approval.

(A) Components and accessories such as those listed in section 2 (C) are likely to be numerous and of a widely varying nature. Only a few are listed but others may also be approved, subject to the general requirements outlined in sections 2 to 7, inclusive.

(B) The technical data to be submitted in substantiation of a request for approval of such components and accessories, except landing-gear shock-absorber struts, and safety belts, which are discussed in chapters VIII and IX, shall include, in addition to the
data outlined in section 4, .reports of tests and/or reports of installation in service showing the parts to be satisfactory for the service conditions which they will encounter. In some cases, such as item *a, b, d,* and e of section 2 (C) (2), stress analyses shall be submitted when deemed necessary.

(C) Approved components and accessories shall be identified in a manner which will preclude any possibility of using the wrong size or model.

Sec.23. Components and Accessories Approved as an Integral Part of the Airplane.

(A) Components and accessories such as those listed in section 2 (C)(3) are of such a nature that their design depends almost entirely upon the characteristics of the particular aircraft model for which they are to be used. Accordingly, components and accessories of this type will not be approved in themselves but may be approved as part of a particular aircraft, in which case they will be included in the aircraft approval.

(B) Technical date covering components and accessories such as those listed in section 2 (C)(3), shall be submitted with the aircraft data accompanying an application for approval of the aircraft.

Chapter VIII. - LANDING-GEAR SHOCK-ABSORBING UNITS.

Sec.24. Design Conditions.

(A) The service for which a landing-gear shock-absorbing unit may be approved will be dependent upon both its energy-absorbing ability and its ultimate strength. The requirements for all aircraft with respect to these two characteristics are outlined in Aeronautics Bulletin 7-A.

(B) When a shock absorber is deigned to dissipate the energy attendant upon landing an airplane by the flow of a liquid through an orifice, provision shall be made in the shock absorber to carry the shocks due to taxiing after the full amount of liquid flow has been utilized.

Sec.25. Technical Date Required.

The data submitted in substantiation of a request for approval of a shock-absorbing unit shall include, in addition to the data specified in section 4:

(A) A stress analysis of the unit, including its end fittings, showing clearly the ultimate strength of all the parts incorporated.

(B) A report of the dynamic test in which the energy absorption of the unit in question has been measured. This test can best be made by dropping a fully loaded shock-absorbing unit, complete with the proper wheel and tire, from such a height that the required amount of energy will have been absorbed or dissipated, and recording the measurements necessary to determine the forces acting. The report shall state all the details, including impact and energy calculations and the deflections of the unit being tested; shall contain photographs of the test set-up, a curve of deflection potted against impact load, and shall be signed by the person who made the test. The required heights of drop for all aircraft and the corresponding maximum permissible impact loads are specified in Bulletin 7-A.

Sec.26. Identification Data.

The identification data affixed to each shock-absorber unit of an approved type shall contain the information specified in section
5 (B) and shall also state the maximum static load for which approval has been granted.

Chapter IX - SAFETY BELTS

Sec.27. Design Conditions.

Safety belts will be approved in two groups and shall be designed in accordance with the following:

(A) Safety belts for use in airplanes shall be capable of withstanding a load of 1,000 pounds applied in the same manner as a
person's weight would be applied to a crash. They shall also be easily adjustable and equipped with a quick-release mechanism capable of being operated by hand under a load of 400 pounds. The quick-release mechanism shall be designed to withstand the. required load of 1,000 pounds without undue distortion, so that when the load is relieved to 400 pounds the mechanism may be worked by hand.

(B) Safety belts for use in gliders shall be capable of withstanding a load of 850 pounds under the conditions outlined in (A). In addition, the release device shall be such that it can not be released inadvertently.

Sec.28. Technical Data Required.

Technical data submitted in substantiation of a request for approval of a safety belt shall include, in addition to the data specified in section 4, a report of tests showing that the belt conforms to section 27.

Sec. 29. Identification Data.

The identification data affixed to each safety belt of an approved type shall contain the information specified in section 5 (B) and if the belt is approved for gliders only it shall be so marked.

Figure 1

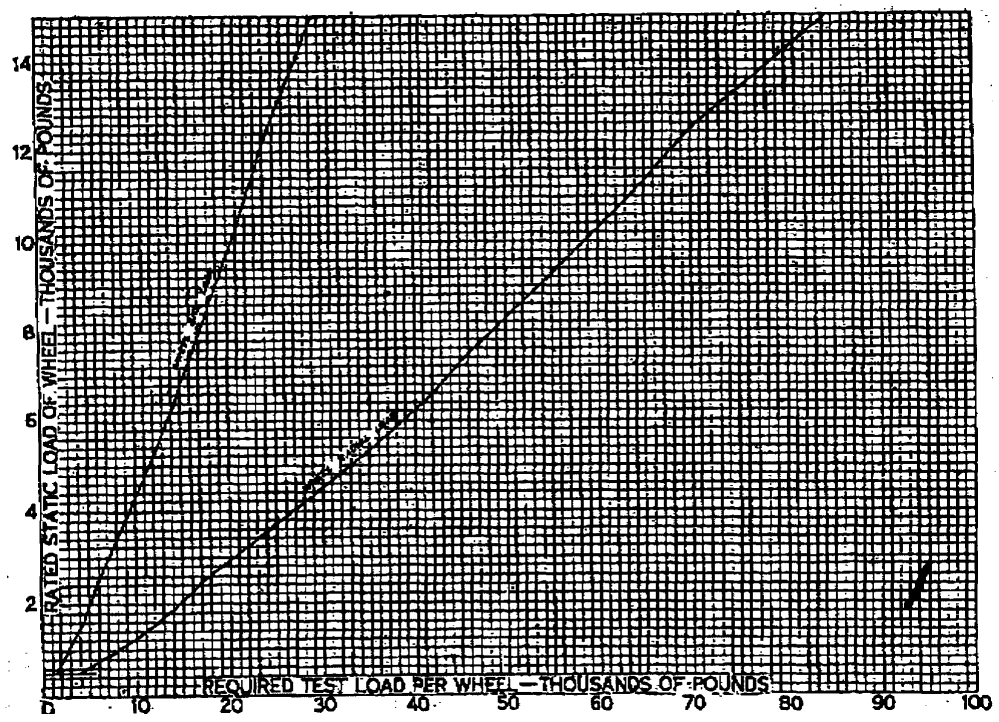


Figure 2

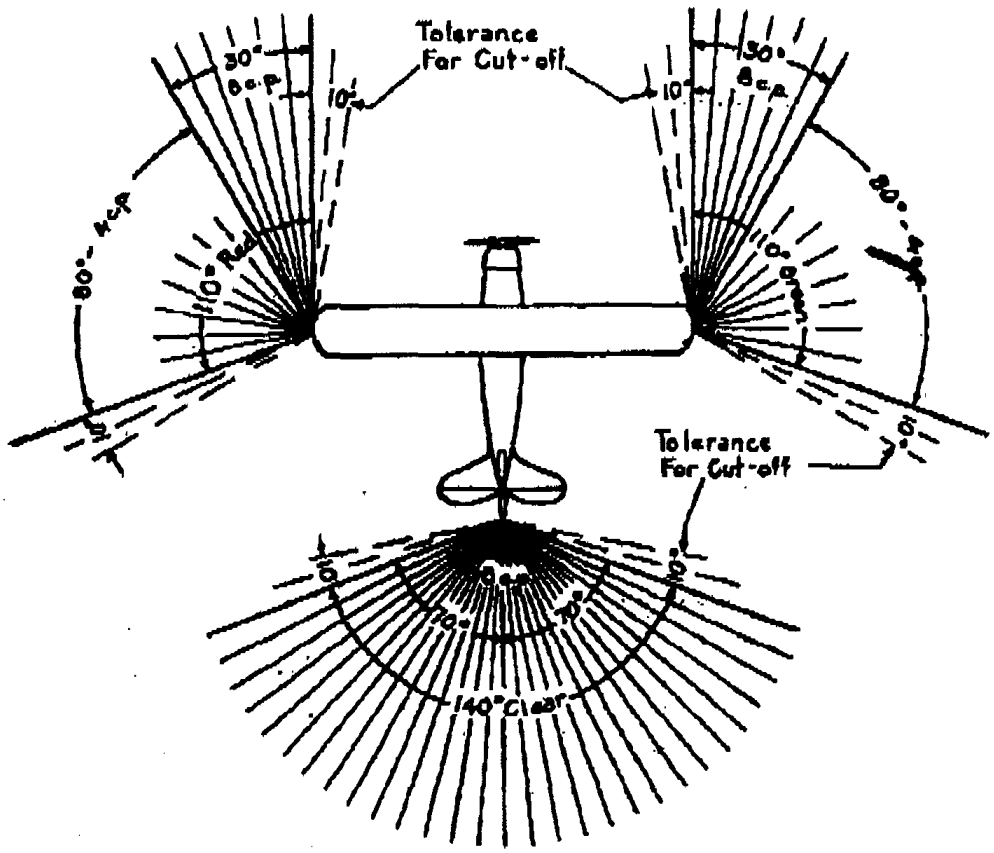
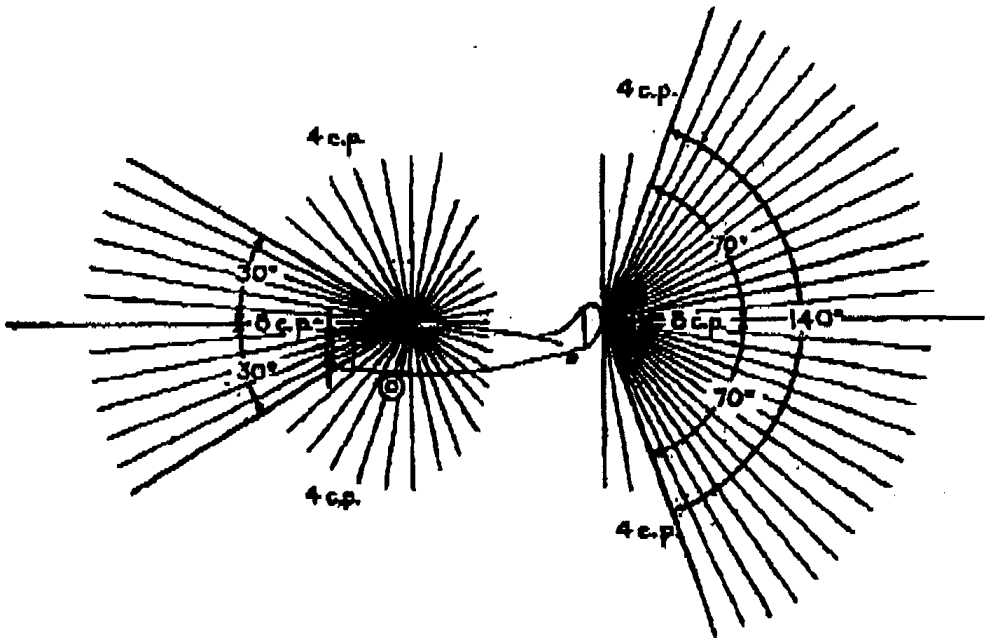


Figure 3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